

Answers and Explanations

Verbal Ability and Reading Comprehension (VARC)

1. Option (4) is correct.

The passage suggests that source countries, particularly in the developing world, should narrow their cultural property laws to reap the benefits of new archaeological discoveries. This is emphasised through the example of China — how China by dropping its cultural property law and embracing collaborative international archaeological research, the Chinese government has nominated 11 archaeological sites for inclusion in the World Heritage Site list. To attain this, the author would definitely suggest allowing foreign countries to analyse and exhibit the archaeological finds made in the source country; adopting China's strategy; even finding ways to motivate other countries to finance archaeological explorations in their country. Option (4) incorrectly focuses on funding institutes in other countries to undertake archaeological exploration in the source country, instead of attracting other countries to finance archaeological explorations in their country.

2. Option (4) is correct.

The passage suggests that archaeological sites are considered important by some source countries because the author mentions that new archaeological discoveries typically increase tourism and enhance cultural pride. Option 1 is incorrect because the passage does mention strict patrimony laws, but it does not suggest that archaeological sites are considered important solely because of these laws. Option 2 is incorrect as the passage discusses patrimony laws as a response to Western cultural imperialism, not as a symbol of it. Option 3 is incorrect because while the passage discusses funding for archaeological projects, it does not specifically connect it to generating funds for future discoveries.

3. Option (1) is correct.

Option 1 would undermine the central idea of the passage because the passage suggests that source countries, particularly in the developing

world, should narrow their cultural property laws to reap the benefits of new archaeological discoveries, including increased tourism and enhanced cultural pride. If UNESCO were to finance archaeological research in poor, archaeologically-rich source countries, it might counter the argument that source countries should rely on their own initiatives and incentives for foreign investment.

In other words, if external financing, such as that provided by UNESCO, is readily available, it might weaken the author's argument that source countries should reconsider their cultural property laws to encourage foreign investment and reap the benefits themselves.

4. Option (1) is correct.

This captures the essence of the paradox, where laws designed to protect cultural property may inadvertently lead to a decrease in the number of new archaeological discoveries, as discussed in the passage. Option 2 is incorrect because the passage does not suggest that patrimony laws resulted in the withholding of national treasure from museums. Instead, it focuses on the impact on the number of archaeological discoveries. Option 3 is incorrect because the passage does mention Sotheby's returning an ancient Khmer statue, but it doesn't suggest that patrimony laws reduced business for auctioneers like Sotheby's. Option 4 is incorrect because the passage does not mention neglect of historical sites due to patrimony laws.

5. Option (1) is correct.

The passage mentions Pinker's focus on conscious, sequential reasoning and how it can improve decision-making in various real-world contexts where individuals must act on uncertain and shifting information. Option 2 is incorrect because the passage does not emphasise Pinker's argument as specifically centered on gaining expertise in statistics or other scientific disciplines. Option 3 is incorrect as the passage primarily discusses the potential benefits of rationality in decision-making,

rather than redirecting public attention to specific issues. Option 4 is incorrect because while Pinker acknowledges the moral aspect of rationality, the passage suggests that the exploration of this aspect is not extensively developed in Pinker's book.

6. **Option (2) is correct.**

The passage notes that despite the power of the sort of rationality Pinker describes, many deep insights in history, including those by ancient Greek philosophers, often originated in moments of epiphany and were not necessarily products of conscious, sequential reasoning. Option 1 is incorrect because the author, as well as Pinker and ancient Greek philosophers, emphasise that rational thinking does involve the belief that the ability to reason logically encompasses an ethical and moral dimension. Option 3 is incorrect because the passage highlights the importance of examining all premises in arguments, which implies a consideration of who is presenting the argument. Option 4 is incorrect because the passage acknowledges the role of conscious reasoning in sorting information but suggests a need to explore hidden factors that contribute to human achievements.

7. **Option (4) is correct.**

The correct answer is 4, as the author refers to the ancient Greek philosophers, specifically Plato and Aristotle, to underscore a potential gap in Steven Pinker's discussion regarding the role of moral and ethical education in promoting rational behaviour. While the ancient Greeks explored the moral dimension of rationality, the passage suggests that Pinker's focus on conscious, sequential reasoning may not fully address the importance of possessing the right moral character for using rationality in beneficial ways.

8. **Option (2) is correct.**

The author uses Kekulé's discovery of the structure of benzene and Mozart's symphonies as examples to illustrate that significant human achievements often involve moments of epiphany and are not solely the result of conscious, sequential reasoning. The examples attribute to the virtue of knowing what you do not know. This supports the idea that flashes of intuition and creativity can play a crucial role in great innovations across various fields.

9. **Option (1) is correct.**

The passage does not explicitly mention the function of academic discourses in raising awareness about environmental preservation.

The focus is on challenging the prevailing understanding of the onset of climate crisis, highlighting the deep connection between the history of climate change and colonialism, and exploring the impact of colonial processes on the contemporary perception of nature and the environment.

10. **Option (3) is correct.**

The passage suggests that the discussion of the colonisation of the Banda islands in "The Nutmeg's Curse" serves to illustrate how European colonialism, through violence and attempts to exploit natural resources, contributed to a mindset that has had enduring effects on the environment, including climate change. The objective behind the mention of the Banda islands is to manifest the decimation of the relationship between humans and Earth and the altered mindset of people in looking at nature as a 'resource' to exploit which subsequently culminates in frequent and more severe heatwaves, storms, floods, droughts and wildfires (climate change). Therefore, the focus is on the impact of colonial practices on the relationship between humans and the Earth.

11. **Option (2) is correct.**

The reviewer uses the pronoun "who" for Gaia, suggesting a perspective that attributes agency and life to the Earth. Option 2, if true, would indicate that non-European societies perceive the Earth as a non-living source of all resources, making the use of "who" for Gaia inappropriate from the viewpoint presented in the passage. As per the passage, the invasion of humans into the Earth has its own set of repercussions and disasters. It is evident in the passage that modern sciences view the Earth as an inert object to be exploited to the maximum. Furthermore, the reviewer condescends to Ghosh's title: "The Nutmeg's Revenge" as an attribution to the use of 'who' for Gaia.

12. **Option (3) is correct.**

The passage does not provide information suggesting that the decentralised characteristic of renewable energy resources, such as solar power, is a reason for the failure of policies seeking to address climate change. Instead, it points to factors like the marginalised status of non-European perspectives, the greed of organisations benefiting from non-renewable energy resources, and the global dominance of oil economies as contributing to the challenges in addressing climate change.

13. Option (3) is correct.

The romantics, as described in the passage, believed that the character of art and beauty should shape all aspects of human life, not confined to a specific domain but influencing both philosophical and ordinary aspects of life. Option 1 is incorrect because the romantics, as per the passage, believed that aesthetics should be a central ingredient in the lives of ordinary men and women, not just philosophers and artists. Option 2 is incorrect because the romantics rejected the identification of aesthetics with a circumscribed domain of human life; instead, they advocated for its influence on all aspects of life. Option 4 is incorrect as the passage does not suggest that aesthetics is considered irrelevant by the romantics; rather, they emphasise its fundamental importance.

14. Option (2) is correct.

The passage suggests that recent studies on romanticism avoid a single definition, specific time, or place because they aim to characterise romanticism in terms of "particular philosophical questions and concerns." This implies a focus on the fundamental and overarching ideas that were central to romantic thought rather than attempting to provide a narrow and rigid definition tied to a specific context.

15. Option (1) is correct.

The passage does not suggest that recent studies seek to refute the differences between national romanticisms. Instead, it indicates that recent studies aim to characterise romanticism by focusing on fundamental philosophical questions and concerns, acknowledging the variety of romanticisms in different nations. Option 2 is supported, as the passage acknowledges the challenges in characterising romantic aesthetics but deems the task both possible and desirable. Option 3 is also supported, as the passage states that many romantics rejected the identification of aesthetics with a circumscribed domain, advocating for its integration into all aspects of human life. Option 4 is supported, as the passage notes that the views of romantics on art and beauty are often found in fragments, aphorisms, and poems, rather than in developed theoretical accounts.

16. Option (2) is correct.

The passage, through Lovejoy's perspective, highlights the main difficulty in studying romanticism as the lack of any "single real entity,

or type of entity" that the concept "romanticism" designates, making it challenging to define with clear conceptual contours. The incorrect answers involve aspects not emphasised in the passage. Option 1 mentions the elusive and suggestive nature of romantic aesthetics, which is actually acknowledged in the passage as a challenge but not identified as the main difficulty. Option 3 suggests the absence of written accounts by romantic poets and artists, which is not stated in the passage. Option 4 refers to the controversial and scandalous history of romantic literature, which is not presented as the primary difficulty but rather as Lovejoy's characterisation of romanticism.

17. Option (4) is correct.

The sentence "For theoretical purposes, arguments may be considered as freestanding entities, abstracted from their contexts of use in actual human activities." best fits at option 3. This is because sentence before this discusses different ways to cash out the relation of support between premises and conclusion, and introducing the theoretical consideration of arguments as freestanding entities aligns with the broader discussion of understanding arguments in theoretical terms, separate from their real-world usage in human communicative practices.

18. Option (4) is correct.

The sentence "Beyond undermining the monopoly of the State on the use of force, armed conflict also creates an environment that can enable organised crime to prosper." best fits at option 3. This is because sentence before this discusses the consequences of armed conflict, while introducing the idea of armed conflict creating an environment for organised crime to prosper aligns with the theme of the paragraph, emphasising the interconnectedness of illicit arms, organised crime and armed conflict.

19. Correct answer is [2].

Sentence 2 is the odd one out. The other sentences in the sequence (1, 4, 3, 5) discuss a shift in hiring practices, emphasising the move away from solely valuing hard skills and the increasing importance of soft skills in job descriptions. Sentence 2, on the other hand, discusses companies redefining the ideal candidate but doesn't directly contribute to the flow of ideas regarding the changing emphasis on skills in hiring practices.

20. Correct answer is [2].

Sentence 2 is the odd one out. The sequence 4-1-3-5 forms a coherent paragraph by discussing

the death of the last speaker of an ancient tribal language (Boa Senior), the historical context of the Andaman Islands, the linguistic significance of the language Bo, and the unfortunate circumstance of Boa Senior being unable to converse in her mother tongue in her final years. Sentence 2, however, introduces information about the indigenous population collapsing after colonisation, which disrupts the flow of the narrative focused on Boa Senior and the Bo language.

21. Correct answer is [2431].

The correct sequence is 2-4-3-1. The paragraph discusses the impact of the printing press on the learning process. Sentence 2 introduces the immediate impact of the printing press on learning methods. Sentence 4 elaborates on how the printing press shifted the learning process from listening and memorisation to reading. Sentence 3 provides additional context, explaining the transformation from listeners to readers. Finally, sentence 1 concludes the paragraph by noting that, despite technological advancements, formal learning remains predominantly based on reading.

22. Correct answer is [3142].

The correct sequence is 3-1-4-2. The paragraph begins by addressing the issue of e-waste containing valuable materials (sentence 3). It then introduces Veena Sahajwalla and her proposed solution to the problem (sentence 1). Following this, the paragraph details her

plan to build microfactories for recycling e-waste (sentence 4). The sequence concludes by describing Sahajwalla's vision of using automated drones and robots in the recycling process (sentence 2). This order creates a coherent flow, starting with the problem, introducing the expert, explaining the solution, and detailing the vision.

23. Option (3) is correct.

This summary accurately captures the main points of the passage. The passage discusses the positive transformation of an Antarctic island's ecosystem following the removal of pests. Birds, such as Antarctic prions and white-headed petrels, are returning and increasing in number. Their activities contribute to a beneficial feedback loop, enhancing soil nutrients and promoting plant growth. The overall revival of the island's flora and fauna is highlighted as a result of environmental protection measures.

24. Option (4) is correct.

The passage explores the evolution of societal expectations and perfectionism. In the 1950s, conformity to mass culture norms was the ideal, portrayed in iconic images of the perfect American family. Today, perfection is associated with standing out through unique style and wit in the attention economy. The summary emphasises the historical shift from conformism to non-conformism in the pursuit of perfection.

Data Interpretation and Logical Reasoning (DILR)

Solution for Questions 1 to 5:

The following table can be drawn for the better clarity.

	Online	Offline	Total
January			
February			
March			
April			
May			
Minimum	40	30	110
Maximum	100	80	130
Median	80	50	120

Statement 1: In every month, both online and offline registration numbers were multiples of 10.

It also means that the total would also be multiple of 10.

Statement 5: The number of online registrations was the largest in May.

As per the table, online can have maximum value of 100.

So, the number of online registrations in May = 100

	Online	Offline	Total
January			
February			
March			
April			
May	100		
Minimum	40	30	110
Maximum	100	80	130
Median	80	50	120

Statement 2: In January, the number of offline registrations was twice that of online registrations.

The number of lowest online registrations in January = 40

Then, the number of offline registrations in January = 80

Only the above set of value is satisfying the above condition because for Online in January, we cannot go below 40 and for offline it cannot be more than 80.

	Online	Offline	Total
January	40	80	120
February			
March			
April			
May	100		
Minimum	40	30	110
Maximum	100	80	130
Median	80	50	120

For May, Online is 100 and the maximum total can be 130 out of all the months and the minimum value for the same month in offline can be 30 only.

So, the only value which offline can have for the month is 30. Because beyond 30 the total will cross its limit of 130 and below 30 it cannot go.

	Online	Offline	Total
January	40	80	120
February			
March			
April			
May	100	30	130
Minimum	40	30	110
Maximum	100	80	130
Median	80	50	120

Statement 3: In April, the number of online registrations was twice that of offline registrations.

Possible values of offline registration in April are 40, 50, 60 and 70.

Possible values of online registrations in April are 50, 60, 70, 80, and 90.

The possible number in which online registrations are double than the offline registrations = 80 and 40 only

	Online	Offline	Total
January	40	80	120
February			
March			
April	80	40	120
May	100	30	130
Minimum	40	30	110
Maximum	100	80	130
Median	80	50	120

Median = Middle number when the number are arranged in ascending or descending order.

Since, there are 5 months and median are given and in the data of 5 number median will always be a middle or 3rd number.

The new table for online offline and total registration when the data is arranged in ascending order is as follows:

Table 2

	1 st	2 nd	3 rd	4 th	5 th
Online	40		80		100
Offline	30		50		80
Total	110		120		130

In Table 1,

50 is the median of offline registrations and 50 has not yet filled, which 50 will appear in either one of the blank places.

Likewise, the minimum value of total registration is 110 which has also not appeared yet in the table, which means out of the 2 blanks, 110 will appear in either of the boxes.

Given: The number of online registrations in March was the same as the number of offline registrations in February.

Case I: 50 Offline registrations in February and 110 total registrations in February.

	Online	Offline	Total
January	40	80	120
February	60	50	110
March	50		
April	80	40	120
May	100	30	130
Minimum	40	30	110
Maximum	100	80	130
Median	80	50	120

	1 st	2 nd	3 rd	4 th	5 th
Online	40	50	60	80	100
Offline	30		50		80
Total	110		120		130

In this the median of Online will not remain 80 instead it will become 60, which is violating the given conditions hence the case is eliminated.

Case II: 50 Offline registrations in February and 110 total registrations in March.

	Online	Offline	Total
January	40	80	120
February		50	
March	50	60	110
April	80	40	120
May	100	30	130
Minimum	40	30	110
Maximum	100	80	130
Median	80	50	120

	1 st	2 nd	3 rd	4 th	5 th
Online	40	50	80		100
Offline	30	40	50	60	80
Total	110		120		130

In Table 2, only one place is left blank in Online registrations and that value must lie between 80 and 100 (both Inclusive) but we have to choose only that value which does not exceed the 130's limit in the total registrations.

Hence, there is only one value possible for blank place.

So, the final tables after filling these will be as follows:

	Online	Offline	Total
January	40	80	120
February	80	50	130
March	50	60	110
April	80	40	120
May	100	30	130
Minimum	40	30	110
Maximum	100	80	130
Median	80	50	120

	1 st	2 nd	3 rd	4 th	5 th
Online	40	50	80	80	100
Offline	30	40	50	60	80
Total	110	120	120	130	130

Case III: 50 Offline registrations in March and 110 total registrations in February.

	Online	Offline	Total
January	40	80	120
February	60	50	110
March	50		
April	80	40	120
May	100	30	130
Minimum	40	30	110
Maximum	100	80	130
Median	80	50	120

	1 st	2 nd	3 rd	4 th	5 th
Online	40	50	60	80	100
Offline	30		50		80
Total	110		120		130

In this case the median of offline becomes 60 which is violating the given condition. Hence, the case is eliminated.

Case IV: 50 Offline registrations in March and 110 total registrations in March.

	Online	Offline	Total
January	40	80	120
February		60	
March	60	50	110
April	80	40	120
May	100	30	130
Minimum	40	30	110
Maximum	100	80	130
Median	80	50	120

	1 st	2 nd	3 rd	4 th	5 th
Online	40	60	80		100
Offline	30	10	50	60	80
Total	110		120		130

The above Table 2 shows that the missing value be at least 80 for the month of February but if we put 80 in Online registrations of February month, then the total will become 140 which is exceeding the limit of 130. Hence, case is eliminated.

So, the only case satisfying the given conditions is as follows:

	Online	Offline	Total
January	40	80	120
February	80	50	130
March	50	60	110
April	80	40	120
May	100	30	130
Minimum	40	30	110
Maximum	100	80	130
Median	80	50	120

- Correct answer is [120].**
From the final table,
The total number of registrations in April = 120
- Correct answer is [40].**
From the final table,
The number of online registrations in January = 40
- Option (1) is correct.**
From the final table,
I. The number of offline registrations was the smallest in May. (True)
II. The total number of registrations was the smallest in February. (False)
Hence, only Statement 1 follows.

4. Option (4) is correct.

From the above table,

Number of offline registrations in February = 50

5. Option (3) is correct.

From the table,

Number of registrations in January = 120

Number of registrations in April = 120

Statement I is True.

Number of registrations in February = 130

Number of registrations in May = 130

Statement II is True.

Hence, both Statements I and II are correct.

Solution for Questions 6 to 10:

Given: All four teams start from Station A at 09:00 hours and must return to Station A by 12:00 hours.

So, the starting point and the end point of their journey will be A for all the teams.

A following table can be drawn using the given information,

	9:00	9:30	10:00	10:30	11:00	11:30	12:00
Team 1	A						A
Team 2	A						A
Team 3	A						A
Team 4	A						A

Using the all the 5 statements given in the questions, we can fill the table,

	9:00	9:30	10:00	10:30	11:00	11:30	12:00
Team 1	A			E		B	A
Team 2	A		E				A
Team 3	A		D	E			A
Team 4	A					E	A

For Team 2,

It reached in 1 hour from A to E.

The only way via which this can be achieved is F.

So, Team 2 went from A to F, then F to E.

	9:00	9:30	10:00	10:30	11:00	11:30	12:00
Team 1	A			E		B	A
Team 2	A	F	E				A
Team 3	A		D	E			A
Team 4	A					E	A

For Team 3,

It reached in 1 hour from A to D.

This can be done only via C.

So, Team 3 went from A to C, then C to D.

	9:00	9:30	10:00	10:30	11:00	11:30	12:00
Team 1	A			E		B	A
Team 2	A	F	E				A
Team 3	A	C	D	E			A
Team 4	A					E	A

Given: None of the streets has more than one team traveling along it in any direction at any point in time.

Now, Team 2 cannot go from E to D from 10:00 to 10:30 because at the same time T3 is going to D to E.

As per the Statement 4,

Team 2 also cannot use A to E route.

So, it must go only from E to F.

	9:00	9:30	10:00	10:30	11:00	11:30	12:00
Team 1	A			E		B	A
Team 2	A	F	E				A
Team 3	A	C	D	E			A
Team 4	A					E	A

For Team 1 and Team 4, at 9:00 to 9:30,

The possible routes are E and B.

From Statement 6, Team 4 cannot go to B,

The only possible case is Team 1 to B and Team 4 to E.

	9:00	9:30	10:00	10:30	11:00	11:30	12:00
Team 1	A	B		E		B	A
Team 2	A	F	E				A
Team 3	A	C	D	E			A
Team 4	A	E				E	A

For Team 1,

At 9:30 it was at B and at 10:30 it is at E.

The only possible way of doing this is via A.

So, the Team 1 was at A at 10:00.

	9:00	9:30	10:00	10:30	11:00	11:30	12:00
Team 1	A	B	A	E		B	A
Team 2	A	F	E				A
Team 3	A	C	D	E			A
Team 4	A	E				E	A

For Team 1, At 10:30 it was at E and at 11:30 it is at B.

The only possible way of doing this is via A.

So, the Team 1 was at A at 11:00.

	9:00	9:30	10:00	10:30	11:00	11:30	12:00
Team 1	A	B	A	E	A	B	A
Team 2	A	F	E				A
Team 3	A	C	D	E			A
Team 4	A	E				E	A

For Team 4 at 9:30,

There are 3 ways possible which are F, A and D.

Out of these 3, that cannot go to D and F because it is given in the Statement 4.

So, the only possibility is A.

So, from 9:30 to 10:00, it will go to A.

	9:00	9:30	10:00	10:30	11:00	11:30	12:00
Team 1	A	B	A	E	A	B	A
Team 2	A	F	E				A
Team 3	A	C	D	E			A
Team 4	A	E	A			E	A

For Team 4 at 10:00,

There are 3 ways possible which are C, B and F.

Out of these 3, that cannot go to B and F because it is given in the Statement 4.

So, the only possibility is C.

So, from 10:00 to 10:30, it will go to C.

	9:00	9:30	10:00	10:30	11:00	11:30	12:00
Team 1	A	B	A	E	A	B	A
Team 2	A	F	E				A
Team 3	A	C	D	E			A
Team 4	A	E	A	C		E	A

For Team 4,

It is on C at 10:30 and it needs to be there on E at 11:30 the only possible way is via A.

So, Team 4 will go to A from 10:30 to 11:00.

	9:00	9:30	10:00	10:30	11:00	11:30	12:00
Team 1	A	B	A	E	A	B	A
Team 2	A	F	E				A
Team 3	A	C	D	E			A
Team 4	A	E	A	C	A	E	A

For Team 3,

It has to go from E to A between 10:00 and 12:00.

It can only be achieved through,

E to D, D to C and C to A.

	9:00	9:30	10:00	10:30	11:00	11:30	12:00
Team 1	A	B	A	E	A	B	A
Team 2	A	F	E				A
Team 3	A	C	D	E	D	C	A
Team 4	A	E	A	C	A	E	A

For Team 2,

It has to go from E to A between 10:30 and 12:00.

It can achieve only in one way,

E to F, F to A and A to F and finally F to A.

So, the final table be as follows:

	9:00	9:30	10:00	10:30	11:00	11:30	12:00
Team 1	A	B	A	E	A	B	A
Team 2	A	F	E	F	A	F	A
Team 3	A	C	D	E	D	C	A
Team 4	A	E	A	C	A	E	A

6. **Option (3) is correct.**

As per the final table,

Number of visits in station C = 3

Number of visits in station D = 2

Number of visits in station E = 5

Number of visits in station F = 3

Highest visited among these is station E.

7. **Correct answer is [2].**

From the above table,

Number of times teams passed through station B = 2

8. **Option (1) is correct.**

From the above table,

The team patrols the street connecting stations D and E at 10:15 hours = Team 3

9. Correct answer is [2].

From the final table,

Number of times Team 4 pass through station

$$E = 2$$

10. Option (2) is correct.

From the final table,

Number of times teams pass through station

$$C = 2$$

Solution for Questions 11 to 15:

The following table can be drawn using the given information,

	Project	Test	Aggregate
Amala			
Koli			
Rini			
Biman			
Mathew			
Shyamal			

Given: The minimum, maximum and the average of both project and test scores were identical– 40, 80 and 60, respectively.

	Project	Test	Aggregate
Amala			
Koli			
Rini			
Biman			
Mathew			
Shyamal			
Minimum	40	40	
Maximum	80	80	
Average	60	60	

It is also given that the projects are done in groups of two, with each group consisting of a female and a male student. Both the group members obtain the same score in the project.

For Projects, minimum score is 40 and it has been given to 2 people, 1 male and 1 female.

Likewise, maximum score is 80 and it has also given to 2 people, 1 male and 1 female.

In the same way, remaining sum = 120

Which will also be distributed among 2 people, 1 male and 1 female.

It is also to be noted that all the girls will have distinct scores in project, likewise all the boys will have distinct scores in the project.

Given: Amala's score in the project was double that of Koli is the same.

The only possibility is when Amala score 80 and Koli scores 40. Then the remaining possible number 60 goes to Rini.

	Project	Test	Aggregate
Amala	80		
Koli	40		
Rini	60		
Biman			
Mathew			
Shyamal			
Minimum	40	40	
Maximum	80	80	
Average	60	60	

Given: The test scores of the students were all multiples of 10; four of them were distinct and the remaining two were equal to the average test scores.

Two score of the test would be 60 and 60. Another 2 scores of test will be 40 and 80.

The sum of remaining two scores = 120

To make them distinct and multiple of 10, the possible scores of other two will be 50 and 70 only.

Given: Biman scored the second lowest in the test.

The only possible score of Biman in the test will be 50.

	Project	Test	Aggregate
Amala	80		
Koli	40		
Rini	60		
Biman		50	
Mathew			
Shyamal			
Minimum	40	40	
Maximum	80	80	
Average	60	60	

Given: Mathew scored more than Rini in the project and Shyamal scored the second highest in the test.

The only possible score for Mathew is 80.

The possible score for Shyamal will be 70.

	Project	Test	Aggregate
Amala	80		
Koli	40		
Rini	60		
Biman		50	
Mathew	80		
Shyamal		70	
Minimum	40	40	
Maximum	80	80	
Average	60	60	

Given: Mathew has scored less than Rini in the test and Koli scored 20 more than Amala in the test.

There are 2 possibilities for this,

Possibility I: Amla scored 40 and Koli scored 60.

Then, Mathew will score 60 and Rini will score 80.

	Project	Test	Aggregate
Amala	80	40	
Koli	40	60	
Rini	60	80	
Biman		50	
Mathew	80	60	
Shyamal		70	
Minimum	40	40	
Maximum	80	80	
Average	60	60	

It is also given that Amla had highest score in aggregate.

It can be observed that Amla's score in project and Mathew's score in project are equal.

In test, Amla's score is lesser than Mathew score. It means that whatever weightage will be given to Test and Project, in all the cases Amla's aggregate score will be lesser than Mathews. So, it can be highest at that moment.

Hence, possibility 1 is eliminated.

Possibility II: Amla scored 60 and Koli scored 80.

Then Mathew will score 40 and Rini will score 60.

	Project	Test	Aggregate
Amala	80	60	
Koli	40	80	
Rini	60	60	
Biman		50	
Mathew	80	40	
Shyamal		70	
Minimum	40	40	
Maximum	80	80	
Average	60	60	

The above case is satisfying the conditions. So, we will take possibility 2 for further data filling.

Given: The aggregate score in the course is a weighted average of the two components, with the weights being positive and adding to 1.

It means that if the weightage of the project is x , then the weightage of test will be $1 - x$.

It is also given that Amala had the highest aggregate score and Shyamal scored two more than Koli, but two less than Amala in the aggregate.

From here, Amala's Aggregate Score = 4 + Koli Aggregate Score

$$\Rightarrow 80x + 60(1 - x) = 4 + 40x + 80(1 - x)$$

$$\Rightarrow 80x + 60 - 60x = 4 + 40x + 80 - 80x$$

$$\Rightarrow 6x = 24$$

$$\Rightarrow x = 0.4$$

It means the weightage of project is 0.4 and the weightage of test is 0.6.

Now, Aggregate score of Amala = $80 \times 0.4 + 60 \times 0.6 = 68$

$$\text{Aggregate score of Koli} = 68 - 4 = 64$$

$$\text{Aggregate score of Shyamala} = 68 - 2 = 66$$

	Project	Test	Aggregate
Amala	80	60	68
Koli	40	80	64
Rini	60	60	
Biman		50	
Mathew	80	40	
Shyamal		70	66
Minimum	40	40	
Maximum	80	80	
Average	60	60	

For Shyamala,

$$\text{Project's score} \times 0.4 + 70 \times 0.6 = 66$$

$$\text{Project's score} = 60$$

So, the only possible value of project's score for Biman is 40.

	Project	Test	Aggregate
Amala	80	60	68
Koli	40	80	64
Rini	60	60	
Biman	40	50	
Mathew	80	40	
Shyamal	60	70	66
Minimum	40	40	
Maximum	80	80	
Average	60	60	

$$\text{Aggregate score of Rini} = 60 \times 0.4 + 60 \times 0.6 = 60$$

$$\text{Aggregate score of Biman} = 40 \times 0.4 + 50 \times 0.6 = 46$$

$$\text{Aggregate score of Mathew} = 80 \times 0.4 + 40 \times 0.6 = 66$$

Hence, the final table will be as follows.

	Project	Test	Aggregate
Amala	80	60	68
Koli	40	80	64
Rini	60	60	60
Biman	40	50	46
Mathew	80	40	66
Shyamal	60	70	66
Minimum	40	40	
Maximum	80	80	
Average	60	60	

11. **Correct answer is [60].**

From the final table,
Score of Rini in the project is 60.

12. **Option (3) is correct.**

Weight of test component was 0.6.

13. **Option (1) is correct.**

The maximum aggregate score obtained by
Amala which was 68.

14. **Correct answer is [40].**

From the final table,
Mathew's score in test was 40.

15. **Option (2) is correct.**

From the final table,
Groups for the project were: Amala–Mathew,
Koli–Biman and Rini–Shyamal.
Neither (i) nor (ii) mentions the correct group.

Solution for Questions 16 to 20:

The given information can be summarised in the following table,

	Window		Split	
	Invertor Type	Non-Invertor Type	Invertor Type	Non-Invertor Type
D1				
D2				
D3				
D4				
Total				

Given: A total of six Window Non-inverter ACs and 36 Split Inverter ACs were sold in the city.

	Window		Split	
	Invertor Type	Non-Invertor Type	Invertor Type	Non-Invertor Type
D1				
D2				
D3				
D4				
Total		6	36	

Given: Among the Inverter ACs sold, 20% were of Window variant.

It also means that among Invertor ACs sold, 80% of the variants were Split variant.

Then, the number of Window Invertor AC = $36/4 = 9$

	Window		Split	
	Invertor Type	Non-Invertor Type	Invertor Type	Non-Invertor Type
D1				
D2				
D3				
D4				
Total	9	6	36	

Given: Total number of ACs sold in the city, 25% were of Window variant, while the rest were of Split variant.

It means that 75% of ACs were Split variant.

Total number of Window ACs sold = $9 + 6 = 15$

Then the number of Split ACs sold = $15 \times 3 = 45$

Out of the split ACs, number of Non-invertor type = $45 - 36 = 9$

	Window		Split	
	Invertor Type	Non-Invertor Type	Invertor Type	Non-Invertor Type
D1				
D2				
D3				
D4				
Total	9	6	36	9

Given: D3 and D4 sold an equal number of Window ACs and this number was one-third of the number of similar ACs sold by D2.

It is also known that every dealer sold at least two Window ACs.

Considering minimum values of 2,

D3 and D4 will sell 2 each Window ACs and D2 will sell 6 ACs.

D1 will sell 5 in this case.

If we take minimum value of 3,

Then D3 and D4 will sell 3 each and D2 will sell 9.

D1 will left with 0 which cannot be possible because the minimum value by each dealer must be 2.

Hence, the only possibility is when we consider minimum value as 2.

	Window			Split	
	Invertor Type	Non-Invertor Type	Total Number of Windows AC	Invertor Type	Non-Invertor Type
D1			5		
D2			6		
D3			2		
D4			2		
Total	9	6	15	36	9

Given: The number of Split ACs sold by D1 was twice the number of Window ACs sold by it.
So, the number of Split ACs sold by D1 = 10

	Window			Split		
	Invertor Type	Non-Invertor Type	Total Number of Windows AC	Invertor Type	Non-Invertor Type	Total Number of Split AC
D1			5			10
D2			6			
D3			2			
D4			2			
Total	9	6	15	36	9	

Given: D2 and D3 were the only ones who sold Window Non-invertor ACs. The number of these ACs sold by D2 was twice the number of these ACs sold by D3.
It means that D1 and D4 have not sold any Window Non-invertor ACs and the number of their total ACs becomes the number of their Invertor ACs.

	Window			Split		
	Invertor Type	Non-Invertor Type	Total Number of Windows AC	Invertor Type	Non-Invertor Type	Total Number of Split AC
D1	5	0	5			10
D2			6			
D3			2			
D4	2	0	2			
Total	9	6	15	36	9	

It is also given that the number of Window Non-Invertors ACs sold by D2 was twice the number of these ACs sold by D3.

It means that D2 and D3 have sold 4 and 2 AC of these types.

	Window			Split		
	Invertor Type	Non-Invertor Type	Total Number of Windows AC	Invertor Type	Non-Invertor Type	Total Number of Split AC
D1	5	0	5			10
D2		4	6			
D3		2	2			
D4	2	0	2			
Total	9	6	15	36	9	

In these scenarios the number of Window Inverter AC sold by D2 and D3 will be 2 and 0, respectively.

	Window			Split		
	Inverter Type	Non- Inverter Type	Total Number of Windows AC	Inverter Type	Non- Inverter Type	Total Number of Split AC
D1	5	0	5			10
D2	2	4	6			
D3	0	2	2			
D4	2	0	2			
Total	9	6	15	36	9	

Given: D1 sold 13 inverter ACs, while D3 sold 5 Non-Inverter ACs.

Then, the number of Split Inverter ACs sold by D1 = $13 - 5 = 8$

Number of Split Non-Inverter ACs sold by D3 = $5 - 2 = 3$

	Window			Split		
	Inverter Type	Non- Inverter Type	Total Number of Windows AC	Inverter Type	Non- Inverter Type	Total Number of Split AC
D1	5	0	5	8		10
D2	2	4	6			
D3	0	2	2		3	
D4	2	0	2			
Total	9	6	15	36	9	

Given: D3 and D4 sold an equal number of Split Inverter ACs. This number was half the number of similar ACs sold by D2.

For Split Inverter ACs,

Sum of the total Split Inverter AC sold by them = $36 - 8 = 28$

D3: D4: D2 = 1: 1: 2

So, number of Split Inverter ACs sold by D3, D4 and D2 are 7, 7 and 14, respectively.

	Window			Split		
	Inverter Type	Non- Inverter Type	Total Number of Windows AC	Inverter Type	Non- Inverter Type	Total Number of Split AC
D1	5	0	5	8		10
D2	2	4	6	14		
D3	0	2	2	7	3	
D4	2	0	2	7		
Total	9	6	15	36	9	

The number of Non-Inverter Split ACs sold by D1 = $10 - 8 = 2$

The total number of Split ACs sold by D3 = $7 + 3 = 10$

The total number of Split AC's sold by all together = $36 + 9 = 45$

So, the final table be as follows:

	Window			Split		
	Inverter Type	Non- Inverter Type	Total Number of Windows AC	Inverter Type	Non- Inverter Type	Total Number of Split AC
D1	5	0	5	8	2	10
D2	2	4	6	14		
D3	0	2	2	7	3	10
D4	2	0	2	7		
Total	9	6	15	36	9	45

16. Correct answer is [14].

From the final table,

Number of Split Inverter ACs did D2 sold = 14

17. Option (3) is correct.

Total number of ACs sold = $45 + 15 = 60$

Number of Non-Inverter type sold = $6 + 9 = 15$

Percentage of Non-Inverter type ACs sold

$$= 100 \times \frac{15}{60} = 25\%$$

18. Correct answer is [33].

The total number of ACs sold by D2 and D4

$$= 6 + 2 + 14 + 7 + 4 = 33$$

19. Option (1) is correct.

Option 1 – D1 and D3 together sold more ACs

as compared to D2 and D4 together. (False)

ACs sold by D1 and D3 together

$$= 5 + 10 + 2 + 10 = 27$$

ACs sold by D2 and D4 together = 33

Option 2 – D2 sold the highest number of ACs.

(Data Inadequate)

Option 3 – D1 and D3 sold an equal number of Split ACs. (True)

From the above table,

Both have sold 10 Split ACs.

Option 4 – D4 sold more Split ACs as compared to D3. (Data Inadequate)

20. Option (2) is correct.

If D3 and D4 sold an equal number of ACs, then the table will be as follows:

	Window			Split		
	Inverter Type	Non- Inverter Type	Total Number of Windows AC	Inverter Type	Non- Inverter Type	Total Number of Split AC
D1	5	0	5	8	2	10
D2	2	4	6	14	1	
D3	0	2	2	7	3	10
D4	2	0	2	7	3	
Total	9	6	15	36	9	45

Then the number of Non-Inverters ACs sold by D2 = $1 + 4 = 5$

Quantitative Aptitude (QA)

1. Option (3) is correct.

$$\therefore \frac{1}{2}, \frac{\log_3(2^x - 9)}{\log_3^4} \text{ and } \frac{\log_5\left(2^x + \frac{17}{2}\right)}{\log_5^4} \text{ are in}$$

A.P.

$$\Rightarrow \log_4^2, \log_4(2^x - 9) \text{ and } \log_4\left(2^x + \frac{17}{2}\right) \text{ are in}$$

A.P.

$$\therefore 2 \log_4(2^x - 9) = \log_4\left(2^x + \frac{17}{2}\right) + \log_4^2$$

$$\Rightarrow (2^x - 9)^2 = 2\left(2^x + \frac{17}{2}\right)$$

$$\text{Let } 2^x = y$$

$$\therefore (y - 9)^2 = 2y + 17$$

$$\Rightarrow y^2 - 20y + 64 = 0$$

$$(y - 16)(y - 4) = 0$$

$$\therefore y - 4 \neq 0 \text{ because } 2^x - 9 > 0$$

$$\therefore y - 16 = 0$$

$$\Rightarrow y = 16$$

$$\Rightarrow 2^x = 2^4$$

$$\Rightarrow x = 4$$

$$\text{Now, common difference} = \log_4(2^x - 9) - \log_4^2$$

$$= \log_4\left(\frac{2^x - 9}{2}\right) = \log_4\left(\frac{16 - 9}{2}\right) = \log_4\left(\frac{7}{2}\right).$$

2. Option (3) is correct.

$$\text{Given that, } 2^{3m} < 2^x < 2^{3n}$$

There are 41 possible integral values of x .

Such that $(m + n)$ is least.

Let least possible value of $m = 1$.

$$\therefore 2^3 < 2^x < 2^{3n}$$

Possible value of x from 4 to 44

$$\therefore \text{Least possible value of } 3n = 45, \text{ hence } n = 15.$$

$$\therefore \text{The smallest possible value of } m + n$$

$$= 1 + 15 = 16.$$

3. Option (1) is correct.

Given system of equations has infinitely many solutions

$$\therefore \frac{1}{a+5} = \frac{1}{b^2-15} = \frac{4}{8b}$$

$$\Rightarrow b^2 - 15 = 2b$$

$$\Rightarrow b^2 - 2b - 15 = 0$$

$$\Rightarrow b^2 - 5b + 3b - 15 = 0$$

$$\Rightarrow (b - 5)(b + 3) = 0$$

$$\Rightarrow b = -3, 5$$

$$\frac{1}{a+5} = \frac{1}{2b} \Rightarrow a + 5 = 2b$$

$$\text{when } b = -3 \Rightarrow a = -11$$

$$ab = 33$$

when $b = 5 \Rightarrow a = 5$

$$ab = 25$$

\therefore The maximum possible value of ab is 33.

4. Option (1) is correct.

$$x^8 + \left(\frac{1}{x}\right)^8 = 47 \Rightarrow \left(x^4 + \frac{1}{x^4}\right)^2 - 2 \cdot x^4 \cdot \frac{1}{x^4} = 47$$

$$\Rightarrow \left(x^4 + \frac{1}{x^4}\right)^2 = 49 \Rightarrow x^4 + \frac{1}{x^4} = 7$$

$$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 - 2x^2 \cdot \frac{1}{x^2} = 7$$

$$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 = 9 \Rightarrow x^2 + \frac{1}{x^2} = 3$$

$$\Rightarrow \left(x + \frac{1}{x}\right)^2 - 2 \cdot x \cdot \frac{1}{x} = 3 \Rightarrow \left(x + \frac{1}{x}\right)^2 = 5$$

$$\Rightarrow x + \frac{1}{x} = \sqrt{5} \Rightarrow \left(x + \frac{1}{x}\right)^3 = (\sqrt{5})^3$$

$$\Rightarrow x^3 + \frac{1}{x^3} + 3x \cdot \frac{1}{x} \left(x + \frac{1}{x}\right) = 5\sqrt{5}$$

$$\Rightarrow x^3 + \frac{1}{x^3} + 3\sqrt{5} = 5\sqrt{5}$$

$$\Rightarrow x^3 + \frac{1}{x^3} = 2\sqrt{5}$$

$$\Rightarrow \left(x^3 + \frac{1}{x^3}\right)^3 = (2\sqrt{5})^3$$

$$\Rightarrow x^9 + \frac{1}{x^9} + 3 \cdot x^3 \cdot \frac{1}{x^3} \left(x^3 + \frac{1}{x^3}\right) = 40\sqrt{5}$$

$$\Rightarrow x^9 + \frac{1}{x^9} + 6\sqrt{5} = 40\sqrt{5}$$

$$\Rightarrow x^9 + \frac{1}{x^9} = 34\sqrt{5}$$

5. Correct answer is [9].

Let α and β are roots of $x^2 + bx + c = 0$

$$\therefore \alpha + \beta = -b \text{ and } \alpha\beta = c$$

$$\frac{1}{\alpha} - \frac{1}{\beta} = \frac{1}{3} \Rightarrow \frac{\beta - \alpha}{\alpha\beta} = \frac{1}{3}$$

$$\Rightarrow \sqrt{\frac{(\alpha + \beta)^2 - 4\alpha\beta}{c}} = \frac{1}{3}$$

$$\Rightarrow \frac{b^2 - 4c}{c^2} = \frac{1}{9} \quad \dots(i)$$

$$\text{Now, } \frac{1}{\alpha^2} + \frac{1}{\beta^2} = \frac{5}{9} \Rightarrow \frac{\alpha^2 + \beta^2}{\alpha^2\beta^2} = \frac{5}{9}$$

$$\Rightarrow \frac{(\alpha + \beta)^2 - 2\alpha\beta}{\alpha^2\beta^2} = \frac{5}{9} \Rightarrow \frac{b^2 - 2c}{c^2} = \frac{5}{9} \quad \dots(ii)$$

On subtracting (i) and (ii), we get $c = \frac{9}{2}$

From (i) we get $b = \frac{9}{2}$

$$\therefore c + b = \frac{9}{2} + \frac{9}{2} = 9.$$

6. Correct answer is [5].

Given, $5^{n-1} < 3^{n+1}$

The values of $n = 1, 2, 3, 4$ and 5 will satisfy the above expression.

Putting $n = 5$ in $3^{n+1} < 2^{n+m}$

$$3^6 < 2^{5+m} \Rightarrow 729 < 2^{5+m}$$

The least power of 2 greater than 729 is 10.

$$\therefore 2^{10} = 2^{5+m} \Rightarrow 5 + m = 10 \Rightarrow m = 5$$

\therefore Least value of $m = 5$.

If we check for other values of n , we may get smaller value of $m = 5$.

7. Correct answer is [468].

A natural number having 15 factors can be of the form: $a^2 \times b^4$ or a^{14} .

Case 1: a^{14}

The smallest possible number $= 2^{14} = 16,384$.

Case 2: $a^2 \times b^4$

The smallest possible number $= 2^2 \times 3^4 = 324$

The smallest possible number $= 2^4 \times 3^2 = 144$

So, the first two natural numbers are 144 and 324

$$\therefore \text{Sum} = 144 + 324 = 468.$$

8. Option (2) is correct.

$$\text{Multiplication factor for price} = \frac{110}{100} \times \frac{95}{100}$$

$$\text{Multiplication factor for quantity} = \frac{105}{100} \times \frac{100}{95}$$

Overall multiplication factor (Including price and quantity)

$$= \frac{110}{100} \times \frac{95}{100} \times \frac{105}{100} \times \frac{100}{95}$$

$$= \frac{110}{100} \times \frac{105}{100}$$

\therefore Profit successive profit 5% and 10%.

$$\begin{aligned} \text{Net profit} &= 5 + 10 + \frac{5 \times 10}{100} \\ &= 15 + 0.5 = 15.5 \end{aligned}$$

9. Option (2) is correct.

Since, time taken by first boat is less than time taken by second boat.

\therefore 2nd boat is slower boat.

Let speed of boat be x km/h and speed of river by y km/h

$$\therefore 2(x + y) = 3(x - y) \Rightarrow x = 5y$$

$$\Rightarrow y = 1 \text{ and } x = 5 \text{ (one possible value)}$$

$$\text{Distanced} = 2(x + y) = 12 \text{ km}$$

Let S is speed of slower boat

$$\therefore \frac{12}{S+1} + \frac{12}{S-1} = 6$$

$$\frac{2[S-1+S+1]}{S^2-1} = 1$$

$$4S = S^2 - 1$$

$$\Rightarrow S^2 - 4S - 1 = 0$$

$$S = \frac{4 \pm \sqrt{16+4}}{2} = 2 + \sqrt{5}$$

Time taken by slower boat from A to B.

$$= \frac{12}{S+1} = \frac{12}{3+\sqrt{5}} \times \frac{3-\sqrt{5}}{3-\sqrt{5}}$$

$$= \frac{12(3-\sqrt{5})}{4} = 3(3-\sqrt{5})$$

10. Option (2) is correct.

Let the sum of average age of A, B and C is y .

$$\therefore \frac{A+B+C+D}{4} = y - x$$

$$\Rightarrow A + B + C + D = 4y - 4x \quad \dots(i)$$

$$\frac{A+B+C+E}{4} = y + 2x$$

$$\Rightarrow A + B + C + E = 4y + 8x \quad \dots(ii)$$

From (ii) - (i),

$$E - D = 12x$$

Given that $E = D + 12$

$$D + 12 - D = 12x \Rightarrow x = 1$$

11. Option (1) is correct.

Since population in 2022 is greater than that in 2020. Therefore overall percentage change is positive.

Given that $x = y + 10$

\therefore Overall % change

$$= -y + (y + 10) + \frac{(-y)(y + 10)}{100}$$

$$= 10 - \frac{y(y + 10)}{100} > 0$$

$$\Rightarrow y(y + 10) < 1000$$

Since, highest value of y satisfying the above inequality is 27.

$$\therefore \text{Least population in 2021} = 1,00,000 \left(1 - \frac{27}{100}\right) = 73,000.$$

12. Option (3) is correct.

Since, combines mixtures A and B in the ratio 2 : 3 to make a new mixture C.

\therefore Let 20 kg and 30 kg of A and B are mixed.

$$\therefore \text{Amount of sugar in C} = \frac{2}{5} \times 20 + \frac{3}{10} \times 30 = 17 \text{ kg}$$

Since, mixes C with an equal amount of milk.

\therefore Amount milk = Amount of C = 50 kg.

Total solution = 50 + 50 = 100 kg.

$$\% \text{ of sugar} = \frac{17}{100} \times 100 = 17\%$$

13. Option (2) is correct.

Let the total work to be done

= Multiple of (7, 15, 6) = 630 units.

Combined efficiency of Rahul, Rakshita and

$$\text{Gurmeet} < \frac{630}{7} = 90 \text{ units/day.}$$

Given that all 3 worked for 6 days and Rakshita worked for 3 days.

$$\therefore 630 = (\text{Combined efficiency of all 3}) \times 6 + (\text{efficiency of Rakshita}) \times 3$$

$$(\text{efficiency of Rakshita}) > 210 - 90 \times 2$$

$$(\text{efficiency of Rakshita}) > 30$$

$$\therefore \text{Time taken by Rakshita} < \frac{630}{30} = 21 \text{ days}$$

Hence she cannot take 21 days to finish the job.

14. Correct answer is [42].

Let number of coins collected by A and B are $3x$ and $4x$, respectively.

Number of coins collected by A in 5 weeks

$$= 5 \times 3x = 15x, \text{ which is multiplied of 7 i.e., } x \text{ is multiple of 7}$$

Number of coins collected by B in 3 weeks

$$= 3 \times 4x = 12x, \text{ which is multiple of 24 i.e., } x \text{ is multiple of 2}$$

So, x is multiple of both 7 and 2, i.e., 14

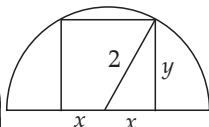
Hence, number of coins collected by A in one week = $3x = 3 \times 14 = 42$

15. Correct answer is [36].

Let Gautam and Suhani do a work in G and S days alone.

$$\therefore \frac{1}{G} + \frac{1}{S} = \frac{1}{20} \quad \dots(i)$$

A.T.Q.

$$\frac{1}{G} \left(1 - \frac{60}{100} \right) = \frac{1}{S} \left(\frac{150}{100} - 1 \right)$$


$$\Rightarrow \frac{1}{G} \times \frac{40}{100} = \frac{1}{S} \times \frac{50}{100} \Rightarrow \frac{1}{S} = \frac{4}{5} \times \frac{1}{G}$$

From (i),

$$\frac{1}{G} + \frac{4}{5} \times \frac{1}{G} = \frac{1}{20} \Rightarrow \frac{9}{5} \times \frac{1}{G} = \frac{1}{20}$$

$$G = 36 \text{ days.}$$

16. Correct answer is [340].

	Mangoes (M)	Bananas (B)	Apple (A)	Total			
Beg.	40x	+	b	+	60x - b	=	100x
Sell	20x		96		0.4 (60x - b)		
Ren	20x	+	(b - 96)	+	0.6 (60x - b)	=	50
	$\Rightarrow 0.46 - 96 + 36x = 30x$						
	$\Rightarrow 6x + 0.4b = 96$						
	$\Rightarrow 15x + b = 240$						
	Now, $60x - b > 1$						
	$75x > 241$						
	$x > \frac{241}{75} = 3.21$						
	$x = 3.4$						
	Total fruits = $3.4 \times 100 = 340$						

17. Option (1) is correct.

$$\therefore AB = AC \text{ and } \angle ABC = \angle ACB$$

In $\triangle ABE$,

$$\cos 60^\circ = \frac{AE}{AB} \Rightarrow \frac{1}{2} = \frac{BE}{AB}$$

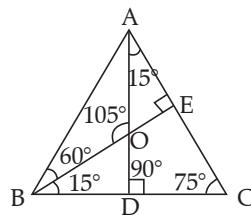
$$AB = 2BE \quad \dots(i)$$

In $\triangle ADC$,

$$\cos 15^\circ = \frac{AD}{AC} = \frac{AD}{AB}$$

$$AB \cos 15^\circ = AD$$

$$\Rightarrow 2BE \cos 15^\circ = AD$$



$$\Rightarrow 2 \cos 15^\circ = \frac{AD}{BE}$$

18. Option (2) is correct.

$$\therefore x^2 + y^2 = 4$$

$$y^2 = 4 - x^2$$

$$\text{Area of rectangle} = 4xy$$

$$A = 4xy = A^2 = 4x^2y^2$$

$$A_1 = 4x^2(4 - x^2)$$

$$\frac{dA_1}{dx} = 8x(4 - x^2) + 4x^2(-2x)$$

$$= 8x(4 - 2x^2) = 0$$

$$\Rightarrow x = \sqrt{2} \text{ (x cannot be -ve)}$$

$$\Rightarrow y = \sqrt{2}$$

$$\text{Ratio of sides} = \frac{2x}{y} = \frac{2\sqrt{2}}{\sqrt{2}} = \frac{2}{1} = 2:1$$

19. Correct answer is [54].

A.T.Q.

$$\text{Interior angle} = \text{exterior angle} + 120^\circ$$

$$\frac{(x-2) \times 180^\circ}{x} = \frac{360^\circ}{x} + 120^\circ$$

$$\Rightarrow \frac{(x-2) \times 3}{x} = \frac{6}{x} + 2$$

$$\Rightarrow 3x - 6 = 6 + 2x \Rightarrow x = 12$$

$$\begin{aligned} \text{Number of diagonals} &= {}^xC_2 - x \\ &= {}^{12}C_2 - 12 = 66 - 12 = 54 \end{aligned}$$

20. Option (3) is correct.

$$S = 1 + \left(1 + \frac{1}{3}\right) \frac{1}{4} + \left(1 + \frac{1}{3} + \frac{1}{9}\right) \frac{1}{16} + \left(1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{27}\right) \frac{1}{64} + \dots$$

$$= 1 + \left(\frac{1}{4} + \frac{1}{3} \times \frac{1}{4}\right) + \left(\frac{1}{16} + \frac{1}{3} \times \frac{1}{16} + \frac{1}{5} \times \frac{1}{16}\right) + \left(\frac{1}{64} + \frac{1}{3} \times \frac{1}{64} + \frac{1}{9} \times \frac{1}{64} + \frac{1}{27} \times \frac{1}{64}\right) + \dots$$

$$= 1 + \left(\frac{1}{4} + \frac{1}{16} + \frac{1}{64} + \dots\right) + \frac{1}{3} \left(\frac{1}{4} + \frac{1}{16} + \frac{1}{64} + \dots\right) + \frac{1}{9} \left(\frac{1}{16} + \frac{1}{64} + \dots\right) + \frac{1}{27} \left(\frac{1}{64} + \dots\right) + \dots$$

$$= 1 + \left(\frac{\frac{1}{4}}{1 - \frac{1}{4}}\right) + \frac{1}{3} \left(\frac{\frac{1}{4}}{1 - \frac{1}{4}}\right) + \frac{1}{9} \left(\frac{\frac{1}{16}}{1 - \frac{1}{4}}\right)$$

$$+ \frac{1}{27} \left(\frac{\frac{1}{64}}{1 - \frac{1}{4}}\right) + \dots$$

$$\begin{aligned}
 &= 1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{9} \times \frac{1}{12} + \frac{1}{9} \times \frac{1}{144} + \dots \\
 &= 1 + \frac{1}{3} + \frac{1}{9} \left(1 + \frac{1}{12} + \frac{1}{144} + \dots \right) \\
 &= 1 + \frac{1}{3} + \frac{1}{9} \times \frac{1}{1 - \frac{1}{12}} = 1 + \frac{1}{3} + \frac{1}{9} \times \frac{12}{11} \\
 &= 1 + \frac{1}{3} + \frac{4}{33} = \frac{33 + 11 + 4}{33} = \frac{48}{33} = \frac{16}{11}
 \end{aligned}$$

21. Option (4) is correct.

$$a_n = 54, 62, 70, 78, 86, 94, 102, 110, \dots, 846$$

$$b_n = 102, 106, 110, \dots, 498$$

$$\text{Common terms} = 102, 110, \dots, 494$$

$$a_n = 494 = 102 + (n - 118) \Rightarrow n = 50$$

$$\therefore S_n = \frac{50}{2}(102 + 494) = 14900$$

22. Correct answer is [3].

Given that $f(x, y)$ is a real-valued function

$$f(3x + 2y, 2x - 5y) = 19x, x, y \in \mathbb{R} \text{ and } f(x, 2x) = 27$$

$$\text{Let } 3x + 2y = a \quad \dots(i)$$

$$2x - 5y = b \quad \dots(ii)$$

On solving (i) and (ii), we get,

$$x = \frac{5a + 2b}{19} \text{ and } y = \frac{2a - 3b}{19}$$

$$\therefore f(3x + 2y, 2x - 5y) = 19x$$

$$f(a, b) = 5a + 2b$$

Now, substituting $a = x$ and $b = 2x$, we get

$$f(x, 2x) = 5x + 4x = 9x = 27$$

$$\Rightarrow x = 3.$$